PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Facility O&M And Program M&E For Grande Ronde Spring Chinook Salmon

BPA project number: 9800703
Contract renewal date (mm/yyyy): 1/2000 ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Confederated Tribes of the Umatilla Indian Reservation

Business acronym (if appropriate) CTUIR

Proposal contact person or principal investigator:

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NPPC Program Measure Number(s) which this project addresses
6.2 Production, 6.26.2 Other Production Measures, 7.1B Conserve Genetic Diversity, 7.2 7.2D Improve Hatchery Production, 7.3B High Priority Supplementation, 7.4A, 7.4D, 7.4D2 Implement Captive Broodstock, 7.4L Production Facilities

FWS/NMFS Biological Opinion Number(s) which this project addresses
The Biological Opinion for Hatchery Actions recommends terminating use of Rapid River broodstock no later than 1996, and development of indigenous broodstock (p. 67, Sections 10.B.3 and 4.

Other planning document references
Conventional and captive broodstock programs for Snake River spring/summer chinook salmon are supported by the Snake River Recovery Team (SRSR, 1994), NMFS Draft Recovery Plan (1995a), Wy-Kan-Ush-Me Wa-Kush-Wit Plan (Vol.II), Grande Ronde Subbasin Plan (ODFW et al. 1990), Northeast Oregon Hatchery (NEOH) Final Siting Report, and NEOH Conceptual Design Report, Genetic Risk Assessment of the Grande Ronde Master Plan (Neeley et al. 1994), Environmental Assessment Grande Ronde Basin Endemic Spring Chinook Salmon Supplementation Program (BPA 1998).

Short description
Develop, implement, and evaluate integrated conventional and captive brood hatchery projects to prevent extinction, and stabilize populations of threatened spring chinook salmon populations in the Grande Ronde River.

Target species
Snake River spring chinook salmon (Oncorhynchus tshawytscha)

Section 2. Sorting and evaluation

Subbasin
Grande Ronde River, Lower Snake River

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more caucus	If your project fits either of these processes, mark one or both	Mark one or more categories
☒ Anadromous fish ☐ Resident fish ☐ Wildlife	☒ Multi-year (milestone-based evaluation) ☐ Watershed project evaluation	☐ Watershed councils/model watersheds ☐ Information dissemination ☒ Operation & maintenance ☐ New construction ☒ Research & monitoring ☐ Implementation & management ☐ Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description
20556	Grande Ronde Endemic Spring Chinook Supplementation Program
8805301	Northeast Oregon Hatchery Master Plan - NPT
9800704	Northeast Oregon Hatchery Master Plan - ODFW
9801001	Grande Ronde Basin Spring Chinook Captive Broodstock Program - ODFW
9202604	Early Life History - ODFW
9801007	Listed Stock Gamete Preservation - NPT
9703800	Captive Broodstock Artificial Propagation - NPT
9800701	Grande Ronde Supplementation - CTUIR
9800702	Grande Ronde Supplementation - O&M/M&E - NPT
9606700	Captive Broodstock Program NMFS - Manchester Marine Laboratory

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
9604400	Grande Ronde Spring Chinook Program-Captive Broodstock- Construction	This is capital construction associated with implementing 9801001.
9801001	Grande Ronde Basin Spring Chinook Captive Broodstock O&M/M&E/Fish Health	Captive brood component . Embryos form the project become the responsibility of the Lower Snake River Compensation Plan and will be acclimated at at tributary of origin.
9800701	Grande Ronde Spring Chinook Program-Construction	Construction of juvenile acclimation and adult trapping facilities for the Program.
9800702	Grand Ronde Supplementation - O&M/M&E/Nez Perce Tribe	Operation, maintenance, monitoring and evaluation for conventional component of the Program for the Nez Perce Tribe.
9801006	Captive Broodstock Artificial Propagation	Captive brood component of the Program (Nez Perce Tribe): planning, implementation and evaluation.
9800704	Grande Ronde Spring Chinook Program-Conventional-O&M/M&E/ODFW	Operation, maintenance, monitoring and evaluation for ODFW: includes transportation and hatchery operations.

9703800	Listed Chinook Salmon Gamete Preservation	Cryopreserve semen from chinook salmon for use in Grande Ronde Spring Chinook Salmon Program
9403900	Wallowa Basin Project Planning	Coordination between various stakeholders (Nez Perce Tribe).
9702500	Implement the Wallowa County/Nez Perce Tribe Salmon Recovery Plan	Coordinate to implement recovery plan.
9202604	Spring Chinook Salmon Early Life History	This project's life history and trapping data will be used to evaluate the success of the Program.
8909600	Monitor, Evaluate Genetic Characteristics of Supplemented Salmon	This project will monitor genetics of chinook salmon populations in the targeted tributaries.
8402500	Grande Ronde Habitat Enhancement (ODFW)	Improved habitat increases likelihood of Program success.
9608300	Upper Grande Ronde Habitat Enhancement (CTUIR)	Improved habitat increases likelihood of Program success.
9403300	Fish Passage Center	Juvenile hatchery and natural salmon resulting from the Program will provide release and migration data for in-river information on migration timing and survival.
9600800	PATH - Participation by State and Tribal Agencies	Naturally-produced juveniles will provide data for life cycle model
9402700	Grande Ronde Model Watershed Habitat Projects	Juveniles produced by Program will provide information on habitat utilization and juvenile production
9405400	Bull Trout Genetics, Habitat Needs, L.H., etc. in Central and NE Oregon	9800703 incidentally collects bull trout for tagging, demographic and recapture data.

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
1997	Preliminary NEPA evaluation completed.	N/A
1997	Completed designs for adult collection and juvenile acclimation facilities at all three stream locations	N/A
1997	Installation/operation of adult collection facilities	Collected 2 fish at Catherine Creek and 9 at Upper Grande Ronde. Fell short of target of retaining a minimum of 10 fish for spawning.
1998	Final NEPA evaluation completed.	N/A
1998	Completed ESA Section 10 permit applications with comanagers.	N/A
1998	Completed comprehensive management plan for the Grande Ronde River basin with comanagers integrating conventional and captive brood.	N/A
1998	Installation/operation of adult collection facilities	Marked enough fish to provide a population estimate. Collected 28 fish at Catherine Creek and 33 at Upper Grande Ronde. Fell short of target of retaining a minimum of 10

		fish for spawning.
1998	Collected 1997 brood year juveniles from Catherine Creek, Lostine and Upper Grande Ronde Rivers	Met targets (500) in all three streams.
1998	Preserved gametes and spawned fish at Bonneville and Manchester.	Spawned 119 1994 brood year and 1 1995 brood year females. Transferred eggs to Irrigon Hatchery (LSRCP) for incubation. Cryopreserved semen from all males not used to fertilize eggs.

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Collect adequate numbers of adult spring chinook salmon to meet conventional broodstock needs to assist in preventing extinction and rebuilding natural chinook salmon populations "in-place, in-kind"..	a	Setup and begin operation of adult collection facilities at the Upper Grand Ronde River and Catherine Creek sites on or about April 15.
		b	Process fish on at least daily basis. Prepare fish selected for broodstock for transport. Release non-selected fish.
		c	Coordinate fish transportation needs with ODFW and CTUIR staff and assist in loading fish.
		d	Maintain living quarters, facilities, and equipment in good working order
		e	Dissemble facilities and equipment on or about September 30
2	Acclimate and release sufficient healthy juvenile spring chinook salmon at the Upper Grande Ronde River and Catherine Creek sites to assist in preventing extinction and rebuilding natural chinook salmon populations "in-place, in-kind".	a	Setup facilities on or around late February or early March
		b	Coordinate fish delivery and release with ODFW
		c	Maintain living quarters, facilities and equipment in proper order
		d	Conduct and document water tests to ensure facilities conform to state water quality standards.
		e	Acclimate and release up to 200,000 smolts at each facility
3	Implement, monitor and evaluate components of the Program in concert with comanagers to determine contribution of the hatchery Program to rebuild populations.	a	Measure fork length, take genetics samples, and determine sex, mark, and injury data for all adults collected.
		b	Mark all salmon released above weir.
		c	Provide trap operation data to comanagers on a weekly basis.

		d	Collect fork length, sex, age, weight, and fecundity data from adults spawned at Lookingglass Hatchery.
		e	Walk one mile reaches below weirs to evaluate potential weir effects on fish behavior.
		f	Obtain and analyze historical temperature and flow data for satellite facility sites.
		g	Monitor stream water temperatures using data loggers and flows using fixed gauges at satellite facilities.
		h	Conduct spawning ground surveys on Grande Ronde River tributaries to estimate population size, sex and age ratios.
		i	Collect juveniles from Catherine Creek and Upper Grande Ronde and Lostine Rivers for rearing in captivity.
		j	PIT and VI-tag captive brood.
		k	Continue development of the captive brood database to evaluate success of Program components.
		l	Document maturation status of captive broodstock at Manchester Marine Laboratory and Bonneville Hatchery.
		m	Collect fork lengths and weights and describe growth for each treatment and stock
		n	Compare growth rates, maturation schedules, and survival among treatments for captive brood.
		o	Compare fecundity, egg size and viability among treatments for captive brood.
		p	Compare egg-to-smolt survival rates of F1 captive brood among treatments.
		q	Compare smolt-to-adult survival rates of F1 captive brood among treatments.
		r	Compare egg-to-smolt survival rates between captive and conventional components.
		s	Compare smolt-to-adult survival rates between captive and conventional components.
		t	Compare juvenile migration performance among captive brood treatments and between conventional and captive brood components.
		u	Collect data from adults spawned at Lookingglass Hatchery.
4	Implement adaptive management and develop revised plans for captive brood and conventional components of the Program.	a	Meet with comanagers to review Program and determine and implement adaptive management changes.
		b	Lead Grande Ronde conventional/captive Technical Oversight Team.

		c	Update and revise Annual Operating Plan with comanagers.
		d	Represent Grande Ronde TOT at Snake River Chinook Salmon Technical Oversight Committee meetings.
		e	Develop specific methods and objectives with comanagers in response to adaptive management.
		f	Update monitoring and evaluation plan to reflect adaptive management changes.
5	Review and implement incidental M & E and develop long-range plans for ESA-listed bull trout and steelhead in the Grande Ronde River basin in concert with comanagers.	a	Meet with comanagers to review and determine data needs for bull trout and steelhead annually.
		b	Collect data, scales, other materials from bull trout and steelhead and share with comanagers.
		c	Cooperate with comanagers and develop long-range plans for Grande Ronde River steelhead.
		d	Collect data from adults spawned at Lookingglass Hatchery

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	4/2000	10/2000	A. Obtain adequate broodstock for conventional component B. Monitor hatchery program success	A. Retain between 10 and 66 fish for production. B. Document 250 adult hatchery salmon to each tributray.	40.00%
2	2/2000	4/2000	Acclimate and and release smolts at each acclimation facility or Lookingglass Hatchery.	Acclimate and /or release 250,000 smolts for each tributary and 150,000 from Lookingglass Hatchery.	15.00%
3	1/2000	12/2000	A.Collect captive brood juveniles. B. Attain adequate progeny-per-parent ratios (PPPR) to reduce the probability of extinction and rebuild populations	A. Target of 500 per tributary. B1. PPPR for conventional component greater than natural. B2. PPPR for hatchery and natural	20.00%

			C. Increase the number of adults returning to Grande Ronde River	fish >1.0 C. Return 250 hatchery adults to each tributary satellite and 150 adults to Lookingglass Hatchery .	
4	1/2000	12/2000	NA		20.00%
5	1/2000	12/2000	NA		5.00%
				Total	100.00%

Schedule constraints
Juvenile facility operation depends upon availability of juveniles. Completion of construction of satellite facilities. Construction of adequate adult holding, incubation, trough, and rearing facilities, if necessary.

Completion date
This project is expected to continue until supplementation is no longer required for spring chinook salmon in the Grande Ronde River basin. Funding may shift to Lower Snake River Compensation Plan when the Program moves from recovery to mititgation.

Section 5. Budget

FY99 project budget (BPA obligated): $323,010

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	2.25 FTE Biologists, 1.5 FTE Facility Operators, 1 FTE Fish Technician, Administration <0.5 FTE	%33	198,297
Fringe benefits	28%	%9	55,523
Supplies, materials, non-expendable property	Mostly facility operation equipment	%5	31,580
Operations & maintenance	Activities, permits	%10	58,420
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	One Trailer One pickup	%7	20,000 22,000
NEPA costs		%0	0
Construction-related support		%0	0
PIT tags	# of tags: 4,000	%2	12,000
Travel	Includes training, vehicle expenses	%6	33,992
Indirect costs	34%	%22	132,536
Subcontractor	ODFW office support, genetic analysis	%6	33,168
Other		%0	0
		TOTAL BPA FY2000 BUDGET REQUEST	$597,516

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
		%0	
		%0	
		%0	
		%0	
		Total project cost (including BPA portion)	$597,516

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$645,317	$696,943	$751,698	$812,914

Section 6. References

Watershed?	Reference
☐	Appleby, A. and K. Keown. 1995. History of White River spring chinook broodstock and captive brood rearing efforts, in (Flagg, T. and C. Mahnken, eds.) An assessment of the status of captive broodstock technology for Pacific salmon. BPA…
☐	BPA (Bonneville Power Association). 1998. Grande Ronde basin endemic spring chinook supplementation program. Environmental Assessment DOE/EA-1173. Portland, Oregon.
☐	Currens, K., J. Lannan, B. Riddel, D. Tave, and C. Wood. 1996. Responses of the Independent Science Panel to questions about the interpretation of genetic data for spring chinook in the Grande Ronde basin. US v. OR Dispute Resolution Document.
☐	DeHart, D. 1996. Application for an emergency permit for scientific purposes and to enhance the propagation or survival of endangered Grande Ronde River Basin spring chinook Oncorhynchus tshawytscha under the Endangered Species Act. May 1996.
☐	DeHart, D. 1998. Application request for modification of Permit 1011 for scientific purposes and to enhance the propagation or survival of endangered Grande Ronde River Basin spring chinook Oncorhynchus tshawytscha under the Endangered Species Act.
☐	Flagg, T.A., and C. Mahnken,. 1995. An assessment of the status of captive broodstock technology for Pacific salmon. Draft Report to Bonneville Power Administration. Contract DE-AI79-93-BP55064. Project 93-56. Portland, OR.
☐	Lothrop, R. C. 1998. Application for a permit to enhance the propagation or survival of endangered Grande Ronde River subbasin (Lostine River component) spring chinook under the Endangered Species Act of 1973.
☐	Montgomery Watson. 1995a. Northeast Oregon Hatchery Project Conceptual Design Final Report. Bonneville Power Administration. Portland, Oregon.
☐	Montgomery Watson. 1995b. Northeast Oregon Hatchery Project Final Siting Report. Bonneville Power Administration. Portland, Oregon.
☐	Montgomery Watson. 1997a. NEOH - Captive Broodstock Satellites Design - 30% Technical Memorandum. Bonneville Power Administration. Portland, Oregon.
☐	Montgomery Watson. 1997b. NEOH - Captive Broodstock Satellites Design - 60% Technical Memorandum. Bonneville Power Administration. Portland, Oregon.
☐	Montgomery Watson. 1998. NEOH - Captive Broodstock Satellites Design - 100% Technical Memorandum. Bonneville Power Administration. Portland, Oregon.
☐	NMFS (National Marine Fisheries Service). 1995a. Proposed recovery plan for Snake River Salmon. U. S. Department of Commerce, National Oceanic and Atmospheric Administration, Portland, Oregon.
☐	NMFS. 1995b. Biological Opinion for 1995 to 1998 hatchery operations in the Columbia

	River basin. Section 7 Consultations. U. S. Department of Commerce, National Atmospheric and Oceanic Administration, Silver Spring, Maryland.
☐	Neeley, D., K. Witty, and S. P. Cramer. 1994. Genetic Risk Assessment of the Grande Ronde River Master Plan. Nez Perce Tribe. Lapwai, Idaho.
☐	NPPC (Northwest Power Planning Council). 1994. 1994 Columbia River Basin Fish and Wildlife Program. Northwest Power Planning Council, Portland, Oregon.
☐	Oregon Department of Fish and Wildlife, Nez Perce Tribe and Confederated Tribes of the Umatilla Indian Reservation. 1990. Grande Ronde River Subbasin Salmon and Steelhead Plan. Columbia Basin System Planning. NPPC, Portland, Oregon.
☐	Smith, C.J., and P. Wampler. 1995. Dungeness River chinook salmon rebuilding project, Progress Report, 1992-1993. Northwest Fishery Resource Bulletin, Project Report, Series No. 3. Washinton Department of Fisheries, Olympia, WA.
☐	SRSRT (Snake River Salmon Recovery Team). 1994. Final recommendations to the National Marine Fisheries Service. Portland, Oregon.
☐	USACOE (U. S. Army Corps of Engineers). 1975. Lower Snake River Fish and Wildlife Compensation Plan. U. S. Army Corps of Engineers Special Report. Walla Walla, Washington.
☐	Witczak, D. 1995. Dungeness chinook restoration project - data accumulation 1993 - 1995. Washington Department of Fish and Wildlife, Olympia, WA.
☐	Wy-Kan-Ush-Me Wa-Kush-Wit, Spirit of the Salmon. 1995. The Columbia River Anadromous Fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs and Yakim Tribes. Columbia River Intertribal Fish Commission.

PART II - NARRATIVE

Section 7. Abstract

The **goal** of this project is to assist in preventing extinction and rebuilding of listed natural chinook salmon populations "in-place, in-kind" as part of the Grande Ronde River Spring Chinook Salmon Program (Program) by supplementing natural production. Our main **project objectives** are to: monitor population status and collect conventional broodstock by operating weirs, return adult salmon “in-place, in kind” through juvenile acclimation, implement adaptive management to deal with changing challenges and to monitor and evaluate the Program so as to make it as effective and efficient as possible. Conventional and captive components of the Program are **supported** by measures 7.1B, 7.2, 7.2D, 7.3B, 7.4A, 7.4D and 7.4D2 of the Columbia Basin Fish and Wildlife Program, the Biological Opinion for Hatchery Actions, and the Snake River Salmon Recovery Team.

Combined conventional and captive brood propagation techniques have been implemented as the **most scientifically sound** blend of techniques to achieve our goal, and both components are essential to success of the Program. The captive brood component was implemented to minimize demographic risk of extinction. Juveniles removed from the populations represent less than 1 adult equivalent. Rearing occurs at two sites to reduce the risk of catastrophic loss to the Program. The conventional component was implemented to balance the captive component and increase production while reducing the genetic risk of artificial selection.

The Program **is expected to produce** substantial adult returns to the target tributaries starting in 2002. Full contributions of multiple brood years at all tributaries are expected in 2004. We expect 200 adults to return per tributary when our smolt releases reach 200,000. As returns increase, reliance on the captive component will diminish and as the demographic risk of extinction decreases, we will increase the conventional component until the captive brood component is phased out .

Cooperative multi-agency, multi-project **monitoring and evaluation** of the effects of the Program on the salmon population will be accomplished through yearly assessment of the adult population at weirs and on spawning grounds, and resulting juveniles production and juvenile migration performance. Success of conventional and captive components in providing fish to augment natural production will be intensively monitored under criteria developed in the captive brood/conventional ESA permit as part of the comprehensive monitoring and evaluation plan developed by comanagers.

Section 8. Project description

a. Technical and/or scientific background

The Grande Ronde River basin once supported large runs of chinook salmon with estimated escapements in excess of 10,000 as recently as the late 1950's. Declines in natural escapement in the basin have paralleled those of other Snake River stocks. Catherine Creek, the Lostine and the upper Grande Ronde rivers were historically three of the most productive populations in the Grande Ronde basin. Escapement levels in these three tributaries rivers dropped to alarming low levels in 1994 and 1995. Continuing poor escapement levels and declining population trends indicate that Grande Ronde River basin spring chinook salmon are in imminent danger of extinction. Without assistance, continued declines appear likely, with progeny-per-parent that ratios have been below 1.0 (replacement) for the past eight completed brood years in the natural environment. Managers are presently in an emergency situation where dramatic and unprecedented efforts are needed to prevent extinction as well as preserve options for use of endemic fish stocks for artificial propagation programs in the future. NEPA review considered alternatives to a captive/conventional program , however use of non-local brood and allowing the fish to go extinct were deemed unacceptable alternatives.

The initial management plan under the Lower Snake River Compensation Plan (LSRCP), emphasizing mitigation, implemented hatchery supplementation from Lookingglass Hatchery with stocks not endemic to the Grande Ronde River in five chinook salmon populations in the basin: Lookingglass and Catherine creeks, and Wallowa, upper Grande Ronde, and Lostine rivers. However, we have shifted emphasis of the chinook salmon program in the Grande Ronde River to conservation. Our short-term goal is to prevent extinction and allow for the possibility of recovery of endemic stocks. Ultimately, recovery of these populations is dependent on improved juvenile and adult survival through mainstem dams and reservoirs. The Grande Ronde Spring Chinook Salmon Program (Program) was developed with two components.

With the initiation of the captive brood program (DeHart 1996), the Oregon Department of Fish and Wildlife, U. S. Fish and Wildlife Service, and Nez Perce Tribe began development of broodstocks from local natural populations for genetic conservation and natural production enhancement. This decision was based on increased emphasis on natural production and endemic stock recovery, consultations and requirements resulting from the ESA-listing of Grande Ronde chinook salmon populations, lack of success using non-local hatchery for supplementation, and preferred strategies for use of artificial propagation identified in the NMFS draft recovery plan (NMFS 1995a).

Captive breeding programs have been used extensively in recovery efforts for fishes as well as other vertebrates, but only recently has this approach been attempted for Pacific salmon. Similar broodstock programs are underway for Sacramento Winter Chinook Salmon, Redfish Lake Sockeye Salmon (BPA 9107300), Salmon River Spring Chinook Salmon (BPA 9900100), White River Chinook Salmon (Appleby and Keown 1995), and Dungeness Chinook Salmon (Smith and Wampler 1995, Witczak 1995). We have used the knowledge and experience gained in these other programs as well as the results of the captive broodstock comprehensive review conducted by NMFS (Flagg and Mahnken 1995) to develop the culture, research, and monitoring and evaluation for the Oregon captive brood component.

Concurrent with early development of the captive brood component, the Confederated Tribe of the Umatilla Indian Reservation joined comanagers with initiation of the second component of the program. The conventional component was designed to increase adult returns with less genetic risk than the captive brood component. The conventional component collects returning adults at each tributary and proceeds as

a traditional program. Unlike the captive component, the demographic costs of the conventional component of the program are high, and success is more highly dependent upon improved juvenile and adult survival through mainstem reservoirs and dams. Unless progeny-per-parent ratios can be improved to greater than 1.0, this component can not provide a meaningful contribution toward increases in natural production, and eventual recovery.

We have designed our Program to first to address the most serious risk to persistence, that of extinction. The use of captive brood is designed to reduce the probability of extinction, but has genetic risks that are greater than the conventional approach. We have adapted a sliding scale which adjusts the proportion of the artificial production from both conventional and captive sources, depending upon the most imminent risk, demographic (extinction) or artificial selection (genetic). Implementation of the scale results in the proportion of the hatchery production from captive brood decreasing (and that of conventional increases) as the number of adults returning increases and the demographic risk of extinction becomes smaller.

b. Rationale and significance to Regional Programs

This project is an integral part of the Grande Ronde Endemic Spring Chinook Salmon Program. This Program is one of the first developed using an integrated two-component approach to prevent extinction of an anadromous salmonid species in the Columbia River basin. Our goal is to prevent extinction of the populations and provide appropriate fish in the future to reverse the decline in stock abundance and facilitate a high probability of population persistence.

Conventional and captive brood components of the Program are supported by recommendations from the Snake River Recovery Team (Snake River Salmon Recovery Team 1994), Northwest Power Planning Council Fish and Wildlife Program (Northwest Power Planning Council 1994) and the National Fisheries Service draft recovery plan (NMFS 1995a). This Program addresses numerous objectives identified in the 1994 Fish and Wildlife Program including 7.1B (conservation of genetic diversity), 7.2 (improvement of existing hatchery production, 7.3B (implementation of high priority supplementation projects), 7.4A (evaluation and implementation of new production initiatives) and 7.4D (implementation of captive broodstock programs). The NMFS draft recovery plan recommends the use of captive broodstock and conventional supplementation programs for severely depressed populations, and specifically advocates its use for Grande Ronde spring chinook salmon and the use of Lookingglass Hatchery. It further recommends the use of endemic broodstock at Lookingglass Hatchery to supplement natural production in the Grande Ronde River . Development of local broodstocks was recommended by an Independent Scientific Review Panel (Currens et al. 1996) under
U. S. v. Oregon Grande Ronde Chinook Salmon dispute resolution in 1996.

This Program is based upon the scientific principle that preservation of within and between population variations in genetic characteristics are essential for long-term fitness and persistence of the metapopulation in the Grande Ronde River .

This project is an integral part of the Program that targets “in-kind in-place” supplementation in the Grande Ronde River. To document baseline and recovery data for returns of hatchery and natural adult salmon to target tributaries and collect broodstock in the most efficient manner, we will operate the adult collection facilities in areas targeted for supplementation and monitor spawning areas. To ensure that the Program will return chinook salmon “in place”, we will operate acclimation facilities in targeted tributaries. Cooperative monitoring and evaluation efforts of all comanagers will ensure that artificial production is being completed effectively and efficiently, and that resulting artificial production is contributing to a reduction in the probability of extinction.

c. Relationships to other projects

This project is fully integrated within the Grande Ronde Endemic Spring Chinook Salmon Program. The Program includes all artificial and natural production and monitoring and evaluations for spring chinook salmon populations within the Grande Ronde River basin.

The captive brood component is a large-scale adaptive management program that examines three different rearing strategies to rear naturally-produced fish to adulthood: 1) accelerated pre-smolt rearing/post-smolt freshwater rearing, 2) natural pre-smolt rearing/freshwater post-smolt rearing, and 3) natural pre-smolt rearing with post-smolt seawater rearing.

The conventional component is an extension of the LSRCP Program. The LSRCP has, for the time being, switched its main focus for spring chinook salmon from mitigation (previously using Rapid River stock) to conservation (endemic Grande Ronde River stocks). This switch from mitigation to conservation requires collection, holding and spawning of endemic adults that is being funded under this project by BPA.

Accomplishing the objectives of the Program depends on the controversial and equivocal success of using hatchery fish to prevent extinction, increase natural production and eventually mitigate for losses due to hydroelectric dam construction and operation. Results from this Program will be crucial for evaluating the potential use of hatchery fish to prevent extinction in other areas with other species (e.g. summer steelhead stocks in the Snake River basin). With the switch to emphasis on conservation and rebuilding natural production, more intense monitoring of natural production is required.

Monitoring and evaluation information collected by this project and generated by other projects in the Program will provide significant contributions to knowledge of captive brood chinook salmon programs and the use of hatchery salmon programs for conservation and restoration of natural production in the Pacific Northwest. The captive brood component of the Program shares data with other captive salmon programs in the Upper Snake River basin and the Pacific Northwest. The captive broodstock component is one of the first such programs in the Columbia Basin and, together with the conventional component, are both completely coordinated with the Lower Snake River Compensation Plan. Eggs produced from spawned captive brood and conventional are the major source for Grande Ronde River smolt production under LSRCP.

1) 8805301 NEOH Planning – NPT – Planning for new construction.
2) 9604400 Grande Ronde Spring Chinook Program – Captive Broodstock – Construction. This is capital construction associated with implementing 9801001

3) 9801001 Grande Ronde Basin Spring Chinook Captive Broodstock. ODFW: Fish culture, management and research staff oversee the captive brood production program at Bonneville Hatchery, activities at Lookingglass Hatchery and evaluation of the captive brood component.

4) 9800701 Grande Ronde Spring Chinook Salmon Program-Construction. Construction of juvenile acclimation and adult trapping facilities.

5) 9800702 Grande Ronde Supplementation - O&M/M&E. Nez Perce Tribe: Operation, maintenance, monitoring and evaluation for conventional component of the Program .

6) 9801006 Captive Broodstock Artificial Propagation. Nez Perce Tribe. Captive brood component of the Program: planning, implementation and evaluation.

7) 9800704 Grande Ronde Spring chinook Program-Conventional-O&M/M&E. ODFW: Operation, maintenance, includes transportation and hatchery operation. Monitoring and evaluation of conventional component.

8) 9703800 Listed Chinook Salmon Gamete Preservation. Nez Perce Tribe: Cryopreservation of semen from chinook for use in Grande Ronde Spring Chinook Salmon Program.

9) 9202604 Spring Chinook Salmon Early Life History. This project's life history and trapping data will be used to evaluate the success of the Program getting additional juveniles from increased adult returns.

10) Lower Snake River Compensation Plan. Lookingglass Hatchery serves as the source hatchery for the spring chinook salmon program for the Grande Ronde River satellites. Spawning of adults, incubation and rearing of progeny of the conventional component of the Program all occur at Lookingglass Hatchery. Substantial sharing of personnel, facilities and expertise between LSRCP and BPA projects is required to allow the Program to function efficiently and effectively.

Additional projects provide contributions to increase likelihood of success of the Program, evaluation data, or provide opportunities for cooperative data collection on species not targeted for collection by these BPA projects (bull trout).

11) 8909600 Monitor, Evaluate Genetic Characteristics of Supplemented Salmon (NMFS): Monitor genetics of populations in the targeted and non-targeted tributaries of the Grande Ronde River.
12) 9702500 Wallowa/Nez Perce Salmon Habitat Recovery (NPT): Improved habitat increases likelihood of Program success.
13) 8402500 Grande Ronde Habitat Enhancement (ODFW). . Improved habitat increases likelihood of Program success.
14) 9608300 Grande Ronde Habitat Enhancement (CTUIR). Improved habitat increases likelihood of Program success.
15) 9402700 Grande Ronde Model Watershed Habitat Projects. Juveniles produced by Program will provide information on habitat utilization and juvenile production.
16) 9403300 Fish Passage Center. Juvenile hatchery and natural salmon resulting from the Program will provide release and migration data for in-river information on migration timing and survival.
17) 9600800 PATH-Participation by State and Tribal Agencies. Naturally-produced juveniles will provide data for a life cycle model.
18) 9405400 Bull Trout Genetics, Habitat Needs, L.H., Etc. in Central and NE Oregon (ODFW/USFS): The Program incidentally collects bull trout and provides tagging, demographic and recapture data to this project.

d. Project history (for ongoing projects)

Project Numbers: Planning for construction of adult collection and juvenile acclimation facilities under projects 8805302 resulted in construction under 9800701. Temporary adult collection facilities were installed and were operated during 1997 under 8805302. Moving into the operation and evaluation phase has required a new project number (9800703) to be assigned to CTUIR.

Project Reports/Technical Papers:

Boe, S.J., and P. T. Lofy. Annual Report for operation and maintenance of adult spring chinook salmon collection satellite facilities on Catherine Creek and the upper Grande Ronde River and hatchery program evaluation: 1997. In preparation. Confederated Tribes of the Umatilla Indian Reservation. Mission, OR.

BPA (Bonneville Power Association). 1998. Grande Ronde basin endemic spring chinook supplementation program. Environmental Assessment DOE/EA-1173. Portland, Oregon.

DeHart, D. 1996. Application for an emergency permit for scientific purposes and to enhance the propagation or survival of endangered Grande Ronde River Basin spring chinook *Oncorhynchus tshawytscha* under the Endangered Species Act. May 1996.

DeHart, D. 1998. Application request for modification of Permit 1011 for scientific purposes and to enhance the propagation or survival of endangered Grande Ronde River Basin spring chinook *Oncorhynchus tshawytscha* under the Endangered Species Act.

Lothrop, R. C. 1998. Application for a permit to enhance the propagation or survival of endangered Grande Ronde River subbasin (Lostine River component) spring chinook under the Endangered Species Act of 1973.

Montgomery Watson. 1995a. Northeast Oregon Hatchery Project Conceptual Design Final Report. Bonneville Power Administration. Portland, Oregon.

Montgomery Watson. 1995b. Northeast Oregon Hatchery Project Final Siting Report. Bonneville Power Administration. Portland, Oregon.

Montgomery Watson. 1997b. NEOH - Captive Broodstock Satellites Design - 60% Technical Memorandum. Bonneville Power Administration. Portland, Oregon.

Montgomery Watson. 1998. NEOH - Captive Broodstock Satellites Design - 100% Technical Memorandum. Bonneville Power Administration. Portland, Oregon.

Oregon Department of Fish and Wildlife, Nez Perce Tribe and Confederated Tribes of the Umatilla Indian Reservation. 1990. Grande Ronde River Subbasin Salmon and Steelhead Plan. Columbia Basin System Planning. NPPC, Portland, Oregon.

Summary of Major Accomplishments for the Project and Program:

1995

Because population sizes were so small and appeared to be in continued decline, the captive broodstock component of the Program was initiated in the Grande Ronde basin in 1995 when we targeted collection of 500 spring chinook salmon juveniles from each Catherine Creek, the Upper Grande Ronde and Lostine rivers under an emergency Endangered Species Act Permit. We met targets except in the Grande Ronde, where we collected only 110 fish. These fish, and all captive brood, were reared until the yearling smolt stage at Lookingglass Hatchery and then were transferred to temporary facilities at Bonneville Hatchery and the Manchester Marine Laboratory. These fish are currently being reared at Lookingglass and Bonneville Hatcheries and Manchester Marine Laboratory. This work was initially funded by the U. S. Fish and Wildlife Service under the Lower Snake River Compensation Plan before switching to BPA funding.

1996

We completed a comprehensive plan for the captive broodstock program and were issued a NMFS ESA Section 10 permit in 1996. We collected parr from the Lostine River and Catherine Creek in 1996. Not enough juvenile were available from the Grande Ronde River to provide for the captive component.

1997

We met our target number of captive brood in all tributaries in 1997. We completed a preliminary NEPA evaluation and preliminary designs for adult collection and juvenile acclimation facilities. The conventional component of the program was initiated in 1997 under a modification to the Section 10 ESA Permit Application for captive brood. Temporary weirs trapped nine adult fish at the upper Grande Ronde site and two at Catherine Creek. All fish retained for broodstock from these sites were returned to the tributaries. Late approval by NMFS of the ESA permit application resulted in retention of only fish from the Lostine River in 1997 for spawning. Twenty-seven fish were captured on the Lostine River and only 6 fish were kept and spawned.

1998

The final NEPA was completed in 1998 as well as designs of adult collection and juvenile acclimation facilities. Little construction was completed in 1998 (construction at the Lostine River acclimation site began in December 1998). We completed design and construction of a conventional brood building at Lookingglass Hatchery in 1998 for holding fish from all three tributaries. A comprehensive management plan and the Section 10 Permit Applications were completed with comanagers.

We again used temporary weirs and captured 33 fish at the Upper Grande Ronde site and 28 at Catherine Creek. In 1998, the number of adult fish retained at all tributaries was smaller than our target number. Late installation of weirs, low adult returns, pre-spawn mortalities resulted in the decision to return fish to the streams. Population estimates from fish marked at the weirs and data collected during spawning surveys (redd counts and carcass recoveries) indicated that populations were larger than predicted and we had failed to intercept at least 2/3 of the run at all three tributaries. Had we intercepted these fish, we would have been able to retain enough fish to meet our target to spawn. We met our target of 500 juveniles for captive brood in all tributaries. We spawned 119 captive brood fish, our first embryos from this component of the Program.

Adaptive management

Catherine Creek and the Upper Grande Ronde and Lostine rivers were historically three of the most productive spring chinook salmon populations in the Grande Ronde basin and suffered significant declines to alarming levels in 1994 and 1995. Dramatic and unprecedented efforts were required to prevent extinction.

The initial management plan under Lower Snake River Compensation Plan called for hatchery supplementation for four chinook salmon populations in the basin: Catherine Creek and the Wallowa, Upper Grande Ronde and Lostine Rivers. A switch to endemic programs in the Grande Ronde River was required due to increased emphasis on endemic stock recovery, listing of Grande Ronde chinook salmon populations as endangered, limited success in using non-local hatchery stocks for supplementation of Grande Ronde chinook salmon populations, and preferred strategies for use of artificial propagation identified in the NMFS draft recovery plan.

Our management plan has two components which are designed to work in conjunction. Captive brood will contribute most of the hatchery production early in the program. As natural production increases, the conventional component will increase, and the captive component will be phased out.

Program results are uncertain. Captive chinook salmon programs throughout the Pacific Northwest show promise, but are relatively new. Use of hatchery fish (captive or conventional) to prevent extinction and rebuild salmon populations through supplementation have been met with mixed results throughout the Region. However, we are convinced captive and conventional components of this Program are the best techniques we have available to preserve genetic material until other changes in the basin occur to allow rebuilding. The Program will provide substantial new knowledge for the use of artificial propagation to increase natural production in the Columbia River basin.

All projects in the Program except LSRCP are being funded by BPA.

Years Underway

Under 8805302: Planning from 1993-1997. Facility design 1997-1998. Construction and operation of temporary adult collection sites in 1997. Activities under this project in 1998 and beyond are for non-Grande Ronde tributaries.

Under 9800703: Operation of temporary adult collection facilities in 1998 and 1999. Use of permanent adult and juvenile facilities in 2000.

Past costs

8805302

Year	1993	1994	1995	1996	1997	1998	1999
Amount	98,000	7,000	0	145,000	306,579	175,000	323,010

Note: Amounts for 1996 and 1997 include work in some other northeast Oregon streams.

Significant cost increases in 2000 are associated with operation of the juvenile acclimation facilities and full participation with comanagers in M&E activities .

e. Proposal objectives

1) Operate and maintain adult collection facilities at the Upper Grande Ronde River and Catherine Creek sites to assist in preventing extinction and rebuilding natural chinook salmon populations "in-place, in-kind".
2) Operate and maintain juvenile acclimation facilities at the Upper Grande Ronde River and Catherine Creek sites to assist in preventing extinction and rebuilding natural chinook salmon populations "in-place, in-kind".
3) Cooperate with comanagers to implement, monitor, and evaluate components of the Program to determine contributions to prevent extinction and rebuild populations. Monitor environmental variables.
4) Implement adaptive management and participate in planning and review of captive brood and conventional components of the Program.
5) Cooperate with comanagers to review and implement incidental monitoring and evaluation and develop long-range plans for ESA-listed bull trout and steelhead in the Grande Ronde River basin.

f. Methods

1. We will trap adult salmon returning to Catherine Creek and the Upper Grande Ronde River from about April 15-September 30. Fish will be processed on a daily basis. Retention guidelines have been approved as part of the multiyear plan that will be submitted to NMFS and are incorporated into the Annual Operations Plan. Brood fish will be prepared for transport to Lookingglass Hatchery. We will coordinate transport with ODFW and assist in loading fish. Fish selected for natural production will be marked for identification upon recovery on the spawning grounds and released upstream of the weir. We will maintain collection facilities and living quarters in proper working order.

2. We will operate and maintain juvenile acclimation facilities (raceways) at the Upper Grande Ronde River and Catherine Creek sites to acclimate a maximum of 200,000 captive brood progeny per facility beginning in late February for 6-8 weeks, then release fish into the streams. We will coordinate fish delivery and release with comanagers. Fish will be fed maintenance rations and mortalities will be kept for autopsy. Effluent will be tested to ensure it conforms to permit requirements.

3. All adults trapped will be given a preliminary sex determination, measured, tissues removed for genetics analysis, and examined for marks or injuries and a preliminary evaluation of sex. Fish collection data will be provided to comanagers weekly. One mile reaches below the weirs will be walked to evaluate effects on adult migration behavior. Spawning ground surveys will be conducted to obtain run size and population sex and age ratios. Stream temperatures and flow will be monitored and historical data obtained and analyzed. Adults spawned at Lookingglass Hatchery will be sampled for fork length, weight, sex, age, and fecundity.

   We will work with comanagers to implement and evaluate Program components:
   We will collect captive brood and PIT and VI-tag fish before transfer to Bonneville Hatchery or Manchester Marine Laboratory. We will continue to collect data and develop, refine and update the captive broodstock database which documents each fish handling event: activity (e.g. injections, spawning, death), maturation status, fork length and weight.

   Abbreviated description of captive brood component for hypothesis testing:
   Naturally produced juveniles captured in each tributary are raised to maturity in captivity (captive brood). Initially, all captive brood juveniles are split into three equal groups for rearing at Lookingglass Hatchery for about nine months (two natural growth and one accelerated growth). One natural growth group is transferred to saltwater rearing at Manchester Marine Laboratory for rearing to

maturity. The other two groups are transferred to Bonneville Hatchery for rearing to maturity. All mature fish are transported to and spawned at Bonneville Hatchery. Fertilized eggs and resulting progeny (F_1 generation) become part of the Lower Snake River Compensation Plan Program.

Specific hypotheses to be tested are:

H_o: Growth rates, maturation schedules and survival of the captive brood among captive brood treatments are similar.

H_o: Fecundity, egg size and egg viability of the captive brood are similar among captive brood treatments.

H_o: Egg-to-smolt survival rates of the F_1 generation are similar among captive brood treatments.

H_o: Smolt-to-adult survival rates are similar among F_1 generation captive brood treatments.

H_o: Parent-per-progeny ratios are similar among F_1 generation captive brood treatments.

H_o: Juvenile survival and migration indexes are similar among F_1 generation captive brood treatments.

H_o: Egg-to-smolt survival rates are similar between captive brood and conventional components.

H_o: Smolt-to-adult survival rates are similar between captive brood and conventional components.

H_o: Parent-to-progeny ratios are similar between captive brood and conventional components.

H_o: Juvenile survival and migration indexes are similar between captive brood and conventional components.

4. We will meet with comanagers to review the Program and implement adaptive management changes. We will lead the Technical Oversite Team (TOT) activities, update and revise the Annual Operating Plan and represent the Grande Ronde TOT in the Snake River Chinook Salmon Oversite Committee. We will develop specific objectives and methods in response to adaptive management. We will update monitoring and evaluation plans to reflect adaptive management changes.

5. Because some bull trout migrate long distances, trapping information from as many trapping sites as possible is required to provide a comprehensive database of bull trout life history. We will develop long-range M&E plans and immediate data needs for steelhead. We cooperate with comanagers to review and implement monitoring and evaluation of bull trout and steelhead captured incidentally at adult weirs.

Factors potentially limiting success:
1) Smolt-to-adult survival rates for both hatchery and natural fish.
2) Health and survival of captive brood fish until spawning (~50% survival expected).
3) Ability to capture adequate numbers of natural and conventional adults at tributary weirs.
4) Adequate fertilization rates for captive brood (75% expected) and conventional fish (95% expected).
5) Adequate egg-to-smolt survival rates for hatchery fish (85% expected).
6) Ability of adult returns from captive and conventional releases to successfully spawn in the natural environment.

g. Facilities and equipment

One adult collection facility and one juvenile acclimation facility on each tributary (Catherine Creek and Upper Grande Ronde River) are planned for completion in 1999 and will be operated under this project. Each adult facility will have a holding capacity of 75 adult salmon. Each acclimation facility will have a holding capacity of 10,000 lbs. of smolts. Depending upon holding density being proposed, if acclimation is required for all smolts, additional facilities may have to be built. Prior to first operation of acclimation facilities (February 2000) a large portion of the standard non-capital items for operation and maintenance of the adult and juvenile facilities (e.g. snowblower, water pumps, pressure washer, DO meters) will have been purchased.

For 2000, office space and utilities for 2.25 biologists and 1.0 technician in La Grande will be required. Facility operators will be stationed at the remote sites. A new desk, laptop computer and desktop computer for technician/biologist use will be required. Two PIT-tag readers meeting revised frequency standards will be required. A materials storage area is required to store equipment and materials and is budgeted for purchase in 1999. Two new, winter-ready travel trailers for remote site use will be required; one scheduled to be purchased in 1999 and one in 2000. Storage for the travel trailers will be required when they are not in use. Four vehicles will be required for the project, one for each satellite facility, two for the project biologists and fish technician. One slip-in portable fish transport tank (for a pickup truck or small trailer) will be constructed and delivered in 1999. It will be used to service water tanks at facilities and transport fish when numbers do not require the use of a larger transport vehicle. A flatbed truck (purchased in 1998) and holding tank will be required to move large numbers of adult fish or fish from different trapping facilities (with more than one compartment) to Lookingglass Hatchery.

Heavy equipment and personnel needed for wintertime facility access/maintenance (e.g. large scale snow removal) will be contracted out.

Completed facilities under other projects upon which this project is dependent are:
Bonneville Hatchery (ODFW)(freshwater captive brood rearing, spawning), Manchester Marine Laboratory (NMFS)(saltwater captive brood rearing), Irrigon Hatchery (ODFW)(incubation and early rearing of captive and conventional brood eggs, fry and parr), Lookingglass Hatchery (ODFW)(captive brood fish rearing prior to transfer, captive brood and conventional juvenile rearing before acclimation, holding and spawning of conventional broodstock).

Additional facilities or modification of existing facilities will probably be needed when the Program is at full capacity due to limited incubation, rearing, and adult holding capabilities. A consulting firm (Montgomery-Watson) is being retained by BPA to evaluate total Program needs.

h. Budget

In 2000, personnel and facility operations costs will comprise substantial portions of the budget. Substantial increases in the 2000 budget reflect operation of additional remote facilities (juvenile acclimation) and full participation with comanagers in M & E activities. These costs include staff to operate four remote facilities (two juvenile acclimation and two adult collection) and participation in monitoring and evaluation of conventional and captive components of the Program.

The majority of materials and supplies are for operation of remote facilities. Capital items will be substantial in 2000 as one trailer is replaced.

Section 9. Key personnel

Peter T. Lofy, Project Leader, 0.75 FTE

Education

B. S. Biology, Loyola Marymount University, 1980
M. S. Fisheries and Wildlife Science, University of Arizona, 1983

Current Employment

Project Leader-Fisheries Research Biologist
Confederated Tribes of the Umatilla Indian Reservation, Department of Natural Resources, Fisheries Program, La Grande, Oregon. January 1990-present.

Primary responsibilities are development, implementation and oversight of research and production projects in usual and accustomed hunting and fishing areas in the Grande Ronde and Imnaha River basins. Oversees projects whose goals are the recovery of endangered salmonid stocks and restoration of natural production and harvest. Supervises two full-time Fish Biologists and 4-6 part-time Fisheries Technicians. Serves as liaison between Pendleton CTUIR Fisheries Program staff and state, federal, and non-CTUIR fishery programs and private landowners.

Past Employment

Project Leader-Fisheries Research Biologist
Confederated Tribes of the Umatilla Indian Reservation, Department of Natural Resources, Fisheries Program, Pendleton, Oregon. October 1988-December 1989.

Primary responsibilities were development and implementation of evaluations of acclimation facilities and oversight of facility operations.

Fish Biologist
U. S. Fish and Wildlife Service, Cook, Washington. August 1984-October 1988.

Primary responsibilities were oversight of operations for laboratory diet analysis for piscine predators of salmonids in John Day Reservoir, Columbia River, collection of predators, and written analysis of results.

Expertise

Fisheries research project development and implementation, personnel management, budget development and tracking, technical report writing, natural production and supplementation research and statistical analysis.

Publications

Hansel, S., S. D. Duke, P. T. Lofy, and G. A. Gray. 1988. Use of diagnostic bones to identify and estimate the original lengths of prey fishes. Transactions of the American Fisheries Society 117:55-62.

Stephen J. Boe, Project Biologist, 1.0 FTE

Education

B. S. Aquatic Biology, Bemidji (Minn.) State University, 1980
M. S. Fisheries Biology, Iowa State University, 1984

Current Employment

Project Biologist-Fisheries Research Biologist
Confederated Tribes of the Umatilla Indian Reservation, Department of Natural Resources, Fisheries Program, La Grande, Oregon. June 1998-present.

Primary responsibilities are oversight of adult chinook salmon trapping and juvenile acclimation facilities, supervision of 2-3 technicians, collection of juveniles, collection of data and transport of fish, summarization of data, writing technical reports and proposals.

Past Employment

Large Lake Specialist
Minnesota Department of Natural Resources, Section of Fisheries, Bemidji, Minnesota.

1987-1997.

Primary responsibilities were conducting annual standardized fisheries monitoring programs on two large lakes. This included sampling fish, collecting, tabulating, and analyzing data, designing and implementing creel surveys, and writing annual reports.

Expertise
Areas of expertise include fish population dynamics, monitoring and evaluation, data analysis and technical report writing.

Project Biologist (Currently unfilled), 0.5 FTE

Section 10. Information/technology transfer

This cooperative Program is expected to provide a wealth of information on various aspects of captive broodstock, supplementation evaluation, and NATURES rearing.

Information will be distributed through Quarterly and Annual Reports, technical papers and posters, peer-reviewed publications, and presentations at technical meetings and to the public. Document distribution will be provided to contracting agencies, grantors of permits and comanagers, and the public.
Extensive interagency information exchange is expected so managers can make informed, sound adaptive management decisions as new data become available. In particular, evaluation of the success of increasing natural production is of prime importance in preventing extinction and planning for recovery.

Congratulations!